similar and still more recent manual by the same author, and called the *Pruning Book*. It is also one of Professor Bailey's "Garden-craft series," and, like its companion volumes, is full of well-told and practical information upon its subject, which, of course, primarily interests those engaged in the care of ornamental trees, shrubbery, orchards, or vineyards.

B. L. R.

Sulphur Bacteria. — Prof. Manabu Miyoshi gives an interesting preliminary account[1] of some of the organisms found in the hot sulphur springs of Japan. The first part of the paper consists mostly of field observations on a long scythe-shaped, peritrichiate, colorless, gelatinous bacterium which grows in masses in the hot springs of Yumoto and is covered with sulphur. The second part consists of an account of species of cophromatium and various other one-flagellate purple or rose-colored water organisms which frequently occur in patches in pools and swamps in the vicinity of the sulphur springs.

The scythe-shaped peritrichiate form is mostly $20 \times 1.4\ \mu$ in size, but other much smaller curved rods occur. In places, also, species of Beggiatoa and Thiothrix may be found. The gelatinous masses grow only near the surface of the water in rapid-flowing hot streams charged with sulphide of hydrogen. They do not occur in quiet water, or in the depths, or in water cooler than 51° C. They are able to grow in very hot water, having been found in rapid streams, the temperature of which was 68° to 69.8° C. (154.4° to 157.6° F.). They have only been found in water containing sulphide of hydrogen, and this gas is believed to be necessary to their growth. Free access of oxygen is necessary to bring about the deposit of the sulphur crystals. The organisms will grow in closed conduits, but no macroscopically visible sulphur is deposited on them. When such masses were removed and put into open running water there was an immediate deposit of sulphur, and in an hour they became indistinguishable from the surrounding flocks. The sulphur deposit, which is very copious, and always, or at least usually, on the outside of the rods, covers even the thinnest threads, and appears to be in some way connected with specific properties of the gelatinous covering of the organisms. No deposits of sulphur at all comparable could be obtained by putting into the water fine linen threads covered with starch jelly, half coagulated albumen, concentrated gela-

[1] M. Miyoshi, Studien über Schwefelrasenbildung und die Schwefelbacterien der Thermen von Yumoto bei Nikko, *Journ. College Sci.*, Imp. Univ., Tōkyō, vol. x, Pt. ii, pp. 143–173, 1897.

tin or thick glue. Under favorable conditions this growth is extremely abundant and very conspicuous, filling the streams and pools with white or yellowish-white, thready, flocculent, firmly anchored, streaming masses, which are usually 3 to 5 cm. long, but which in small rapid brooks sometimes reach a length of 20 cm. The water of Yumoto is only very feebly acid, but contains a large amount of sulphide of hydrogen (about 0.04 grams per liter), and also considerable calcium bicarbonate (0.0624 grams per liter). Professor Miyoshi suggests that these organisms, the protoplasm of which must be endowed with great energy owing to the temperature at which it grows, oxidize the H_2S *directly* to H_2SO_4, which acid does not interfere with the life of the bacteria because it is quickly neutralized by the alkaline bicarbonate of the running water. A discussion of the morphology and physiology of these organisms is reserved for a subsequent paper, no opinion being ventured as to whether the gelatinous masses consist of one or of several species.

In the second part, the chemotropism of *Chromatium weissii* is discussed, and some new genera and species of the red sulphur bacteria are established. The three new genera are Thioderma, Thiosphærion, and Thiosphæra. Using Pfeffer's capillary method he obtained among others the following results with *Chromatium weissii*. It was powerfully attracted by the following substances: water containing various quantities of sulphide of hydrogen, 0.3% potassium nitrate, 0.3% ammonium nitrate, 0.3% ammonium phosphate, 0.5% ammonium tartrate, 0.3% potassium sodium tartrate, 0.3% monopotassium phosphate (neutralized by sodium carbonate). It was feebly attracted by 0.5% cane sugar, 0.5% grape sugar, 0.5% milk sugar, 0.5% asparagin. It was nearly indifferent to 0.5% glycerine, 0.3% magnesium sulphate, 0.3% ammonium chloride. It was strongly repelled by 0.5% malic acid. The organism also reacts to contact irritation. The temperature of the water in which these red bacteria grew was 23° to 35° C. An attractive lithographic plate accompanies the paper.

ERWIN F. SMITH.

Ripening of Cheese. — Persons who are fond of Roquefort, Camembert, and other piquant cheeses will be surprised to learn that fully one-half of the bulk of such cheeses, and often much more, consists of the mycelium and spores of fungi. These are not accidental impurities but necessary constituents, by means of which the various cheeses are ripened, and to which they owe their peculiar flavors. In reality, those who eat these appetizing cheeses consume